REMARKS

Claims 1, 6, and 7 were rejected under 35 U.S.C. 102(a) as being anticipated by Misewich, et al. (US Patent 6,365,913). Claims 2, 3, 4 and 4 have been rejected under 35 U.S.C. 103(a) as being unpatentable over Misewich in view of Chu.

The present device claims a metal channel, not an oxide channel as described in Misewich at column 6, line 45 for example.

Patent 6,365,913, in fact, teaches away from the use of a metal channel. It teaches the use of an oxide material for the channel called Mott-Hubbard insulator. These insulators must be doped with typically 15% carriers per site before there are sufficient carriers to conduct. There are two global states of these doped Mott-Hubbard insulators, which are characterized by strongly correlated charge carriers. One state is non-conductive and the other is conductive. The material can undergo a transition from a non-conductive to a conductive state upon application of an electric field. The Mott transition field effect transistor requires this material and material transition to operate. This material forms the basis of device operation and allows the transistor to switch on and off with an applied electric field.

The present device requires neither a Mott-Hubbard insulator, nor a Mott transition to operate. The width of the conducting channel and the number and type of carriers are changed by an electric field to operate the present device. The channel is composed of metal, not an oxide material. In the metal channel of the present device, the charge carriers do not have to be strongly correlated. A metal in equilibrium without an electric field will not have two global states. Metals do not have to be doped or metallized to increase the number of free carriers and will

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conduct without doping. The conductance of metals is much larger than that of either silicon or Mott-Hubbard insulators in the conductive state.

When used in the channel of a field effect transistor a Mott-Hubbard insulator will result in vastly different device characteristics compared to a similar device with a metal channel. In the device of Misewich et al. (see column 4 lines 21-28) only a few atomic layers of the Mott material channel near the gate oxide will conduct while the rest remains insulating in the fully on state. By contrast, in the present device, in the fully on state, the entire undepleted metal channel will conduct, not just the surfaces. A metal channel transistor has, therefore, much higher transconductance than a similarly sized Mott material channel not only because the entire undepleted channel can conduct but also because of the higher conductance of metals. By contrast, the dielectric relaxation time of a metal is extremely short and the present device can be used for applications that require extremely high speeds.

Chu, et al. (US 2004/0227154) teaches the use of a composite channel and a preferred embodiment with a SiGe channel of thickness in the range of 7 to 8 nm and a Ge channel of thickness in the range of 1.5 to 2.0 nm. The total thickness of the composite channel is between 8.5 nm and 10 nm. It is not obvious based on the thickness of only the Ge part of this composite channel, and does not suggest to one skilled in the art, the channel thickness in the present device.

Chu et al. discloses the use of silicon, germanium, and silicon germanium layers to create compressive and tensile strain to optimize hole mobilities in a semiconductor channel

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specifically for p-channel Si/SiGe devices. In such devices, the composition of the layers and the thicknesses of each layer in the entire structure are important to ensure that the proper amount of mechanical strain is produced. Layer thicknesses are designed to maximize hole mobility in SiGe. The present device does not have a SiGe channel but a metal channel and the use of layer thicknesses to control strain is not necessary. It is not evident that devices designed for mechanical strain with such different materials and lattice spacings should have the same thickness and, in fact, the total thickness of the composite channel of Chu et al.

Claims 8, 9, 10, 11, 12, 13, 14, and 15 were rejected under 35 U. S.C. 103(a) as being unpatentable over Wei, et al. (US 2004/0169227) in combination with Misewich, et al. (US Patent 6,365,913), Song et al. (US 2004/0149679) and Ogura et al. (US 2002/0045319). Wei, et al. (US 2004/0169227) discloses doping methods for fully depleted silicon-on-insulator structures. Misewich et al. teach the use of an oxide material for the channel called Mott-Hubbard insulator material. The present device uses neither silicon-on-insulator nor Mott-Hubbard insulator materials. It would not be obvious to someone of ordinary skill to combine the structure from Wei with Mott insulators to produce the present device.

With respect to claim 14, Song et al. (US 2004/0149679) and Ogura also fail to disclose or suggest the claimed combination of features in the present invention.

Even if the structure of Wei, et al. (US 2004/0169227) were combined with the material of Misewich, et al. (US Patent 6,365,913), and the dimensions of Song et al. (US 2004/0149679) and Ogura et al. (US 2002/0045319), Claim 1 distinguishes as the

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combination does not show a metal channel. Reconsideration of the claims is respectfully requested.

The Examiner is encouraged to telephone the undersigned attorney to discuss any matter that would expedite allowance of the present application.

Respectfully submitted,

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